

Calculus I Study Guide for Final Exam – Part A

1. Find the indefinite integral. Differentiate to check your answer.

$$\int u^2 \sqrt[3]{u^3 - 1} \, du$$

2. Solve the differential equation. (Use separation of variables to obtain the general solution then find the particular solution that satisfies the initial condition.)

$$\frac{dv}{dt} = -(0.1v + 9.8) \qquad v(0) = 450$$

3. Find the definite integral, using integration by parts then long division of polynomials.

$$\int_0^1 \ln(x^2 + 4) dx$$

4. Evaluate the definite integral.

$$\int_0^{\pi/4} x \cos 2x dx$$

5. Sketch the graphs the following two functions, shading the region bounded by these two functions. Find the volume of the solid formed by revolving this region around the line $x = 2$.

$$y = x^2$$

$$y = 2x$$

6. Find the arc length from $(0,3)$ clockwise to $(2, \sqrt{5})$ along the circle $x^2 + y^2 = 9$.

Calculus I Study Guide for Final Exam – Part B

7. An open tank has the shape of a vertical right circular cone and stands 4 feet off the ground. The tank is 8 feet across at the top and 6 feet high. How much work is done in pumping water in through the bottom of the tank to a depth of 2 feet? Weight-density of water is 62.4 pounds per cubic foot.

8. Evaluate the definite integral.

$$\int_0^1 \cosh^2 x \, dx$$

9. Find the integral. (Use a Pythagorean identity to rewrite the integral.)

$$\int \tan^3 4x \sec^4 4x \, dx$$

10. Find the integral. (Use trigonometric substitution to rewrite the integral.)

$$\int \frac{\sqrt{x^2 - 25}}{x} \, dx$$

11. Find the integral. (Use polynomial division and then partial fractions to rewrite the integral.)

$$\int \frac{2x^3 - 4x^2 - 15x + 5}{x^2 - 2x - 8} dx$$

12. Evaluate the limit using L'Hôpital's Rule. Show ALL steps!

$$\lim_{x \rightarrow \infty} \frac{\ln x^4}{x^3}$$